

T15D09 – (Part 15.1) Standard Enthalpy Changes of Reactions

Name _____

1. 15.1.1 Define and apply the terms standard state, standard enthalpy change of formation ΔH_f^\ominus and standard enthalpy change of combustion ΔH_c^\ominus . (2)
 - a. Define standard enthalpy of formation:
 - b. What is the standard state?
 - i. Example using AgBr
 - ii. Example using CH₄
 - iii. Example using O₂
 - iv. What are two NON examples for AgBr (note why they are not correct)
 - c. What is the enthalpy of combustion?
 - i. Give example equations for CH₄ and CH₃CH₂OH
 - d. Generally values for enthalpies of formation are _____ and a couple exceptions are:
2. 15.1.2 Determine the enthalpy change of a reaction using standard enthalpy changes of formation and combustion. (3)
 - a. What is the equation for the standard enthalpy of reaction?
 - b. Calculate the enthalpy change of the equation $3 \text{ CuO (s)} + 2 \text{ Al (s)} \rightarrow 3 \text{ Cu (s)} + \text{Al}_2\text{O}_3 \text{ (s)}$ Given:
 - i. $\Delta H_f^\ominus [\text{CuO}] = -155 \frac{\text{kJ}}{\text{mol}}$
 - ii. $\Delta H_f^\ominus [\text{Al}_2\text{O}_3] = -1669 \frac{\text{kJ}}{\text{mol}}$

- c. Calculate the enthalpy change of reaction for the hydrogenation of propene to form propane $\text{CH}_3\text{-CH=CH}_2(\text{g}) + \text{H}_2(\text{g}) \rightarrow \text{CH}_3\text{-CH}_2\text{-CH}_3(\text{g})$ Given:
- $\Delta H^\ominus_c [\text{C}_3\text{H}_6(\text{g})] = -2509 \frac{\text{kJ}}{\text{mol}}$
 - $\Delta H^\ominus_c [\text{H}_2(\text{g})] = -286 \frac{\text{kJ}}{\text{mol}}$
 - $\Delta H^\ominus_c [\text{C}_3\text{H}_8(\text{g})] = -2220 \frac{\text{kJ}}{\text{mol}}$
- d. What is the enthalpy of atomization, give two equations:
- $\Delta H^\ominus_{\text{at}}$ of noble gases are always _____
 - $\Delta H^\ominus_{\text{at}}$ have what value, positive or negative?
 - $\Delta H^\ominus_{\text{at}}$ is found by
- e. For physical changes, enthalpy can be found between two transitions, define each
- Standard enthalpy of fusion
 - Standard enthalpy of vaporization
 - When calculating heat change of a phase change, there is no change in temperature, explain how boiling water would give a value of zero for $q=mc\Delta T$. What equation could you use to solve for heat change during this process?
 - If ice ($\text{H}_2\text{O}_{(\text{s})}$) at -25°C is heated to water vapor ($\text{H}_2\text{O}_{(\text{g})}$) at 125°C , the following phase change occurs....